**Simple Machines, Culminating Project**

Objectives: Students will be able to apply their knowledge of simple machines to construct a compound

machine.

Students will describe the work accomplished by their design in terms of forces and distances

involved with each step.

Preparation: Students will have to have knowledge and experience with a variety of simple machines. Use of

the Delta Science kits units will suffice.

Students will be in partnerships for this project.

Collect general building materials from home – cardboard, tubing, coat hangers, wire, woods,

plastics, metals, tape, paper cups and plates, marbles, etc.

Procedure: 1. Select a simple task – from list of example or student-generated

2. Design a compound machine that incorporates at least 3 simple machines in order to

accomplish the task

3. Create a labeled blueprint of the compound machine

4. Generate a written explanation of 3 of the simple machines used. Explanations contain:

a. What simple machine is being used

b. What task it is responsible for accomplishing

c. What work is being done – force over a distance

d. What raw materials are being used in its construction

5. Build/adjust/test compound machine

6. Present compound machine to class

Details:

1. Select a simple task – from list of example or student-generated

Provide a list of tasks that can be performed using a series of simple machines:

Pop a balloon Catch a mouse Strike a match

Set a golf ball on a tee Raise a flag Put toothpaste on a toothbrush

Squeeze an orange Fill a cup of water Turn a doorknob

Share/discuss grading rubric: Simple Machines Grading Rubric

Review simple machines:

Safari Montage: Over 3 hours of video clips from Bill Nye, The Way Things Work, etc. <http://safari.isb.bj.edu.cn/SAFARI/montage/playlistedit.php?playlisttype=MY&Action=MakeActive&playlistkeyindex=145&location=local>

BrainPop: <http://www.brainpop.com/technology/simplemachines/>

Examples of practical applications of simple machines by 2 students: <http://www.youtube.com/watch?v=yKBK10VUrQw&feature=fvw>

2. Design a compound machine that incorporates at least 3 simple machines in order to

accomplish the task

Provide students with many examples of constructible compound machines. Generate class lists about what tasks simple machines are capable of completing.

How to build a Rube Goldberg machine: <http://www.wonderhowto.com/how-to/video/how-to-build-a-rube-goldberg-machine-with-kids-204880/>

Rube Goldberg, including his cartoons to analyze: <http://www.rubegoldberg.com/>

3. Create a labeled blueprint of the compound machine

Using A3 grid paper, teams are responsible for drawing the blueprint for a compound machine. Teams are encouraged to use their prior knowledge of simple machines to explore some possibilities for compound machines. Labels should include all forces and simple machine parts. The three individual simple machines need to be labeled with a 1, 2, and 3.

4. Generate a written explanation of 3 of the simple machines used.

For each of the simple machines, labeled 1, 2, and 3 on the blueprint, a written or word-processed paragraph explanation must also be submitted. The explanation should include how the simple machine will work once the forces are introduced to it. What will the resulting force and outcome is once the simple machine is used. And why this particular machine was chosen. For enrichment, students can choose to attempt to numerically analyze the work as a result of the forces over distance done by each particular simple machine.

5. Build/adjust/test compound machine

Using the materials collected by each classroom, students are asked to build their compound machine. Testing and adjusting is encouraged during the construction phase of the project. Communication, collaboration, and cooperation are also encouraged.

6. Present compound machine to class

Each group will be allowed to present how their group met or attempted to meet the task presented to them by introducing their simple machine to the class. Multiple classes can get together for a “Simple Fair” where half of a team remains with their compound machine to present it to visitors, while the other half of the team visits. Then teammates switch positions so that everyone gets a chance to visit and everyone gets a chance to present.

Grading Rubric:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 4 | 3 | 2 | 1 |
| Blueprint | Design contains at least 3 simple machines. It is creative, practical, neat and all parts are labeled. | Design contains at least 3 simple machines. It is practical, neat, and most parts are labeled. | Design contains any number of simple machines, but it is not practical, not done neatly, or poorly labeled. | Design contains less than 3 simple machines. 2 or 3 are true: It is not practical, not done neatly, and poorly labeled. |
| Explanation | All simple machines are clearly described in terms of the mechanical advantage and work they provide, why they were chosen, and numerical estimations are made. | All simple machines are described in terms of the mechanical advantage and/or work they provide and why they were chosen. | Less than 3 of the simple machines are described in terms of the mechanical advantage and/or work they provide and why they were chosen. | Less than 3 of the simple machines are described in terms of the mechanical advantage or work they provide or why they were chosen. |
| Presentation | Describes the task, the teams’ process at finding a solution, and the compound machine. Captures and maintains the audience’s interest throughout. | Describes the task, the teams’ process at finding a solution, and the compound machine. Information is presented in an interesting manner. | Descriptions of the task, the teams’ process, or the parts of the machine are missing. Audience interest may wane. | Descriptions of the task, the teams’ process, or the parts of the machine are missing. Audience interest is not held. |
| Teamwork | Responsibilities are shared evenly within the group and everyone feels that the project benefited from their input. | Responsibilities are shared evenly within the group but some members may be seen as more essential than others. | Responsibilities are not shared evenly within the group. | Some members do not contribute or contributing members do not encourage full participation by all. |

October 14, 2009

Dear Parents,

As our science unit on simple machine comes to an end, fifth graders will be asked to construct their very own compound machine. In order to do so, we will need a variety and a good number of construction supplies, most of which can be found or are usually discarded at home. As you come across any of these items and no longer have a use for them, we are asking that you donate them to your child’s homeroom class in order to add to the general construction supplies. Below is a list of possible items, but if you have items that are not on this list that would be useful and safe for construction purposes, please send them in, as well.

cardboard paper towel or toilet paper tubes coat hangers

wire plastic bags string or yarn boxes

tape foil paper cups and plates marbles

wood, plastic, and dull metal scraps straws clay

Thank you for your assistance with our project!

The Grade 5 Team